

What is Claimed is:

1. An electrical circuit in a communications channel, comprising:

a first sub-circuit having a first input which

5 receives a composite signal that includes a transmission signal component and a receive signal component, a second input which receives a replica transmission signal, a third input which receives a common-mode shift current, and an output which provides a receive signal which comprises the

10 composite signal minus the replica signal; and

a second sub-circuit for controlling the common-mode shift current, so that the magnitude of the composite signal does not exceed a predetermined value of an operating parameter of the electrical circuit.

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2. The electrical circuit of claim 1, further comprising a power supply voltage source of a predetermined magnitude, wherein the operating parameter is the predetermined magnitude of the power supply voltage source.

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3. The electrical circuit of claim 1, wherein the second sub-circuit includes a common-mode feedback circuit.

4. The electrical circuit of claim 3, wherein the common-mode feedback circuit includes an operational amplifier.

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5. The electrical circuit of claim 4, wherein the operational amplifier has a first input which receives a first differential component of the composite signal, a second input which receives a second differential component 10 of the composite signal, a third input which receives a common-mode voltage signal, and an output which provides a common-mode shift current control signal.

6. The electrical circuit of claim 5, wherein 15 the common-mode feedback circuit further includes a pair of transistors, each transistor having a respective input and wherein the output of the operational amplifier is coupled to the respective input of each of the transistors.

20 7. The electrical circuit of claim 1, wherein the second sub-circuit includes a current source.

25 8. The electrical circuit of claim 7, wherein the current source provides a constant common-mode shift current control signal.

9. The electrical circuit of claim 1, wherein
the second sub-circuit includes a resistor divider.

5 10. The electrical circuit of claim 9, wherein
the resistor divider comprises a plurality of resistors,
each of the resistors having a respective characteristic
resistance.

10 11. The electrical circuit of claim 10, wherein
the resistor divider provides a common-mode shift current
control signal that is related to the respective
resistances of each of the resistors.

15 12. An electrical circuit in a communications
channel, comprising:

an active resistive summing circuit which
produces a receive signal as a difference between a
composite signal and a replica transmission signal, the
20 composite signal comprising a transmission signal component
and a receive signal component; and

a common-mode shift current control circuit which
controls the magnitude of the composite signal.

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13. The electrical circuit of claim 12, further comprising a power supply voltage source of a predetermined magnitude.

5 14. The electrical circuit of claim 13, wherein the common-mode shift current control circuit controls the magnitude of the composite signal to be less than the magnitude of the power supply voltage source.

10 15. The electrical circuit of claim 12, wherein the common-mode shift current control circuit includes a common-mode feedback circuit.

16. The electrical circuit of claim 15, wherein
15 the common-mode feedback circuit includes an operational amplifier.

17. The electrical circuit of claim 16, wherein
the operational amplifier has a first input which receives
20 a first differential component of the composite signal, a second input which receives a second differential component of the composite signal, a third input which receives a common-mode voltage signal, and an output which provides a common-mode shift current control signal.

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18. The electrical circuit of claim 17, wherein
the common-mode feedback circuit further includes a pair of
transistors, each transistor having a respective input and
5 wherein the output of the operational amplifier is coupled
to the respective input of each of the transistors.

19. The electrical circuit of claim 12, wherein
the common-mode shift current control circuit includes a
10 current source.

20. The electrical circuit of claim 19, wherein
the current source provides a constant common-mode shift
current control signal.

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21. The electrical circuit of claim 12, wherein
the common-mode shift current control circuit includes a
resistor divider.

20 22. The electrical circuit of claim 21, wherein
the resistor divider comprises a plurality of resistors,
each of the resistors having a respective characteristic
resistance.

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23. The electrical circuit of claim 22, wherein the resistor divider provides a common-mode shift current control signal that is related to the respective resistances of each of the resistors.

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24. An electrical circuit in a communications channel, comprising:

an active resistive summer having a first input which receives a composite signal that includes a transmission signal component and a receive signal component, a second input which receives a replica transmission signal, a third input which receives a common-mode shift current, and an output which provides a receive signal which comprises the composite signal minus the replica signal; and

a common-mode shift current control circuit which controls the magnitude of the common-mode shift current to thereby control the magnitude of the composite signal.

20 25. The electrical circuit of claim 24, further comprising a power supply voltage source of a predetermined magnitude.

26. The electrical circuit of claim 25, wherein

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the magnitude of the common-mode shift current is controlled to control the magnitude of the composite signal to be less than the magnitude of the power supply voltage source.

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27. The electrical circuit of claim 25, wherein the magnitude of the common-mode shift current is controlled to control the magnitude of the composite signal to be equal to the magnitude of the power supply voltage source.

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28. The electrical circuit of claim 24, wherein the common-mode shift current circuit includes a common-mode feedback circuit.

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29. The electrical circuit of claim 28, wherein the common-mode feedback circuit includes an operational amplifier.

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30. The electrical circuit of claim 29, wherein the operational amplifier has a first input which receives a first differential component of the composite signal, a second input which receives a second differential component of a composite signal, a third input which receives a

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common-mode voltage signal, and an output which provides a common-mode shift current control signal.

31. The electrical circuit of claim 30, wherein
5 the common-mode feedback circuit further includes a pair of transistors, each transistor having a respective input and wherein the output of the operational amplifier is coupled to the respective input of each of the transistors.

10 32. The electrical circuit of claim 24, wherein the common-mode shift current control circuit includes a current source.

15 33. The electrical circuit of claim 32, wherein the current source provides a constant common-mode shift current control signal.

20 34. The electrical circuit of claim 24, wherein the common-mode shift current control circuit includes a resistor divider.

35. The electrical circuit of claim 34, wherein the resistor divider comprises a plurality of resistors, each of the resistors having a respective characteristic

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resistance.

36. The electrical circuit of claim 35, wherein the resistor divider provides a common-mode shift current 5 control signal that is related to the respective resistances of each of the resistors.

37. A communication method for a communications channel, comprising:

10 receiving at a first input a composite signal that includes a transmission signal component and a receive signal component;

receiving at a second input a replica transmission signal;

15 receiving at a third input a common-mode shift current;

providing a common-mode shift current to substantially prevent the magnitude of the composite signal from exceeding a predetermined value of an operating 20 parameter of the electrical circuit; and

providing a receive signal comprising the composite signal minus the replica signal at an output.

38. The method of claim 37, further comprising

providing a power supply voltage source of a predetermined magnitude, wherein the operating parameter is the predetermined magnitude of the power supply voltage source.

5 39. The method of claim 37, wherein the common-mode shift current is provided by a common-mode feedback circuit.

10 40. The method of claim 39, wherein the common-mode feedback circuit includes an operational amplifier.

15 41. The method of claim 40, further comprising:

receiving a first differential component of the composite signal at a first input of the operational amplifier;

receiving a second differential component of the composite signal at a second input of the operational amplifier;

20 receiving a common-mode voltage signal at a third input of the operational amplifier; and

providing a common-mode shift current control signal at an output of the operational amplifier.

42. The method of claim 41, further comprising

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receiving the common-mode shift current control signal at an input of a first transistor and at an input of a second transistor.

5 43. The method of claim 37, wherein the common-mode shift current is provided by a current source.

44. The method of claim 43, further comprising the step of providing a constant common-mode shift current.

10 45. The method of claim 37, wherein the common-mode shift current is provided by a resistor divider.

46. The method of claim 45, wherein the resistor 15 divider comprises a plurality of resistors, each resistor having a respective characteristic resistance.

47. The method of claim 46, wherein the common-mode shift current is related to the respective resistances 20 of each of the resistors.

48. A communication method for a communications channel, comprising:
producing a receive signal as a difference

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between a composite signal and a replica transmission signal, the composite signal comprising a transmission signal component and a receive signal component; and controlling the magnitude of the composite signal.

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49. The method of claim 48, further comprising providing a power supply voltage source of a predetermined magnitude.

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50. The method of claim 49, wherein the magnitude of the composite signal is controlled to be less than the magnitude of the power supply voltage source.

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51. The method of claim 49, wherein the magnitude of the composite signal is controlled to be equal to the power supply voltage source.

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52. The method of claim 48, wherein the magnitude of the composite signal is controlled by a common-mode feedback circuit.

53. The method of claim 52, wherein the common-mode feedback circuit includes an operational amplifier.

54. The method of claim 53, further comprising:

receiving at a first input a first differential component of the composite signal;

5 receiving at a second input a second differential component of the composite signal;

receiving at a third input a common-mode voltage signal; and

providing at an output a common-mode shift

10 current control signal.

55. The method of claim 54, further comprising

providing the output of the operational amplifier to an input of a first transistor and an input of a second

15 transistor.

56. The method of claim 48, wherein the

magnitude of the composite signal is controlled by a current source.

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57. The method of claim 56, further comprising providing a constant common-mode shift current control signal to control the magnitude of the composite signal.

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58. The method of claim 48, wherein the magnitude of the composite signal is controlled by a resistor divider.

5 59. The method of claim 58, wherein the resistor divider comprises a plurality of resistors, each of the resistors having a respective characteristic resistance.

60. The method of claim 59, further comprising
10 controlling the magnitude of the composite signal in relation to the respective resistances of each of the resistors.

61. A method for a communications channel
15 comprising:
receiving at a first input a composite signal that includes a transmission signal component and a receive signal component;

20 receiving at a second input a replica transmission signal;

receiving at a third input a common-mode shift current;

controlling the magnitude of the common-mode shift current to thereby control the magnitude of the

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composite signal; and

providing at an output a receive signal which comprises the composite signal minus the replica signal.

5 62. The method of claim 61, further comprising

providing a power supply voltage source of a predetermined magnitude.

63. The method of claim 62, wherein the

10 magnitude of the common-mode shift current is controlled to control the magnitude of the composite signal to be less than the magnitude of the power supply voltage source.

64. The method of claim 62, wherein the

15 magnitude of the common-mode shift current is controlled to control the magnitude of the composite signal to be equal to the magnitude of the power supply voltage source.

65. The method of claim 61, wherein the

20 magnitude of the common-mode shift current is controlled by a common-mode feedback circuit.

66. The method of claim 65, wherein the common-mode feedback circuit includes an operational amplifier.

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67. The method of claim 66, further comprising:
receiving at a first input a first differential
component of the composite signal;

5 receiving at a second input a second differential
component of the composite signal;

receiving at a third input a common-mode voltage
signal; and

10 providing at an output a common-mode shift
current control signal.

68. The method of claim 67, further comprising
providing the output of the operational amplifier to an
input of a first transistor and an input of a second
15 transistor.

69. The method of claim 61, wherein the
magnitude of the common-mode shift current is controlled by
a current source.

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70. The method of claim 69, further comprising
providing a constant common-mode shift current control
signal.

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71. The method of claim 61, wherein the magnitude of the common-mode shift current is controlled by a resistor divider.

5 72. The method of claim 71, wherein the resistor divider comprises a plurality of resistors, each of the resistors having a respective characteristic resistance.

10 73. The method of claim 72, further comprising providing a common-mode shift current control signal that is related to the respective resistances of each of the resistors.

15 74. An electrical circuit for a communications channel, comprising:

means for receiving at a first input a composite signal that includes a transmission signal component and a receive signal component;

20 means for receiving at a second input a transmission signal;

means for receiving at a third input a common-mode shift current;

means for providing a receive signal comprising the composite signal minus the replica signal; and

means for providing a common-mode shift current to substantially prevent the magnitude of the composite signal from exceeding a predetermined value of an operating parameter of the electrical circuit.

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75. The electrical circuit of claim 74, further comprising means for providing a power supply voltage source of a predetermined magnitude, wherein the operating parameter is the predetermined magnitude of the power supply voltage source.

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76. The electrical circuit of claim 74, wherein the common-mode shift current is provided by a common-mode feedback circuit means.

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77. The electrical circuit of claim 76, wherein the common-mode feedback circuit means includes operational amplifier means.

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78. The electrical circuit of claim 77, further comprising:

means for receiving a first differential component of the composite signal at a first input of the operational amplifier means;

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means for receiving a second differential component of the composite signal at a second input of the operational amplifier means;

means for receiving a common-mode voltage signal

5 at a third input of the operational amplifier; and

means for providing a common-mode shift current control signal at an output of the operational amplifier means.

10 79. The electrical circuit of claim 78, further comprising means for providing the common-mode shift current control signal at an input of a first transistor and at an input of a second transistor.

15 80. The electrical circuit of claim 74, wherein current source means provide the common-mode shift current.

81. The electrical circuit of claim 80, further comprising means for providing a constant common-mode shift current.

20 82. The electrical circuit of claim 74, wherein resistor divider means provide the common-mode shift current.

83. The electrical circuit of claim 82, wherein
the resistor divider means comprises a plurality of
resistors, each resistor having a respective characteristic
5 resistance.

84. The electrical circuit of claim 83, wherein
the common-mode shift current is related to the respective
resistances of each of the resistors.

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85. An electrical circuit for a communications
circuit, comprising:

means for producing a receive signal as a
difference between a composite signal and a replica
15 transmission signal, the composite signal comprising a
transmission signal component and a receive signal
component; and

means for controlling the magnitude of the
composite signal.

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86. The electrical circuit of claim 85, further
comprising means for providing a power supply voltage
source of a predetermined magnitude.

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87. The electrical circuit of claim 86, wherein the means for controlling the magnitude of the composite signal control the magnitude of the composite signal to be less than the magnitude of the power supply voltage source.

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88. The electrical circuit of claim 86, wherein the means for controlling the magnitude of the composite signal control the magnitude of the composite signal to be equal to the magnitude of the power supply voltage source.

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89. The electrical circuit of claim 85, wherein the magnitude of the composite signal is controlled by common-mode feedback circuit means.

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90. The electrical circuit of claim 89, wherein the common-mode feedback circuit means include operational amplifier means.

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91. The electrical circuit of claim 90, further comprising:

means for receiving at a first input a first differential component of the composite signal;

means for receiving at a second input a second differential component of the composite signal;

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means for receiving at a third input a common-mode voltage signal; and

means for providing at an output a common-mode shift current control signal.

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92. The electrical circuit of claim 91, further comprising means for providing the output of the operational amplifier means to an input of a first transistor and an input of a second transistor.

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93. The electrical circuit of claim 85, wherein the magnitude of the composite signal is controlled by current source means.

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94. The electrical circuit of claim 93, further comprising means for providing a constant common-mode shift current control signal to control the magnitude of the composite signal.

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95. The electrical circuit of claim 85, wherein the magnitude of the composite signal is controlled by resistor divider means.

96. The electrical circuit of claim 95, wherein

the resistor divider means comprises a plurality of resistors, each of the resistors having a respective characteristic resistance.

5 97. The electrical circuit of claim 96, further comprising means for controlling the magnitude of the composite signal in relation to the respective resistances of each of the resistors.

10 98. An electrical circuit for a communications channel, comprising:

 means for receiving at a first input a composite signal that includes a transmission signal component and a receive signal component;

15 means for receiving at a second input a replica transmission signal;

 means for receiving at a third input a common-mode shift current;

20 means for controlling the magnitude of the common-mode shift current to thereby control the magnitude of the composite signal; and

 means for providing at an output a receive signal which comprises the composite signal minus the replica signal.

99. The electrical circuit of claim 98, further comprising means for providing a power supply voltage source of a predetermined magnitude.

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100. The electrical circuit of claim 99, wherein the means for controlling the magnitude of the common-mode shift current is controlled to be less than the magnitude of the means for providing a power supply voltage source of 10 a predetermined magnitude.

101. The electrical circuit of claim 99, wherein the means for controlling the magnitude of the common-mode shift current is controlled to be equal to the magnitude of 15 the means for providing a power supply voltage source of a predetermined magnitude.

102. The electrical circuit of claim 99, wherein the magnitude of the common-mode shift current is 20 controlled by common-mode feedback circuit means.

103. The electrical circuit of claim 102, wherein the common-mode feedback circuit means includes operational amplifier means.

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104. The electrical circuit of claim 103,
further comprising:

means for receiving at a first input a first
5 differential component of the composite signal;
means for receiving at a second input a second
differential component of the composite signal;
means for receiving at a third input a common-
mode voltage signal; and
10 means for providing at an output a common-mode
shift current control signal.

105. The electrical circuit of claim 104,
further comprising means for providing the output of the
15 operational amplifier to an input of a first transistor and
an input of a second transistor.

106. The electrical circuit of claim 98, wherein
the magnitude of the common-mode shift current is
20 controlled by current source means.

107. The electrical circuit of claim 106,
further comprising means for providing a constant common-
mode shift current control signal.

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108. The electrical circuit of claim 98, wherein the magnitude of the common-mode shift current is controlled by resistor divider means.

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109. The electrical circuit of claim 108, wherein the resistor divider means comprises a plurality of resistors, each of the resistors having a respective characteristic resistance.

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110. The electrical circuit of claim 109, further comprising means for providing a common-mode shift current control signal that is related to the respective resistances of each of the resistors.

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